APPENDIX D

QUALITY ASSURANCE/QUALITY CONTROL

CALIBRATION PROCEDURES AND RESULTS

All of the equipment used is calibrated in accordance with the procedures outlined in the *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III (*EPA-600/4-77-027b). The following pages describe these procedures and include the data sheets.

DRY GAS METER AND ORIFICE METER

Dry gas meters and orifices are calibrated in accordance with Section 3.3.2 of the QA Handbook. This procedure involves direct comparison of the dry gas meter to a reference dry test meter. The reference dry test meter is routinely calibrated using a liquid displacement technique. Before its initial use in the field, the metering system is calibrated over the entire range of operation. After each field use, the metering system is calibrated at a single intermediate setting based on the previous field test. Acceptable tolerances for the initial and final gas meter factors and orifice calibration factors are Y ±0.02 and ΔH ±0.015 from average, respectively.

ENVIRONMENTAL QUALITY MANAGEMENT

Box No.:	2	Bar. Press.(Pb):	29.87	in. Hg	
Date:	December 29, 2015	Calibrated By :	BF		

		RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6
DH	Delta H	0.50	0.75	1.00	1.50	2.00	4.00
in Hg	Vacuum	10	10	10	10	10	10
Vw_1	Initial RTM	135.096	146.103	159.132	173.657	190.840	210.929
Vw_2	Final RTM	145.783	158.926	173.445	190.537	210.472	238.321
Vd_1	Initial DGM	294.981	305.983	319.065	333.718	351.136	371.614
Vd_2	Final DGM	305.670	318.853	333.495	350.842	371.150	399.604
Tw	Ave. Temp RTM °F	67	67	67	67	69	68
Td	Ave. Temp DGM °F	68	74	79	82	85	89
t	Time (min.)	25.0	25.0	25.0	25.0	25.0	25.0
$Vw_2 - Vw_1$	Net Volume RTM	10.687	12.823	14.313	16.880	19.632	27.392
$Vd_2 - Vd_1$	Net Volume DGM	10.689	12.870	14.430	17.124	20.014	27.990
	Y	1.001	1.008	1.011	1.009	1.006	1.007
	dH@	1.524	1.572	1.670	1.791	1.766	1.797

AVERAGE Y =	**1.005**	(Reference meter correction factor of 0.9979)			
Average Y Range =		0.985	TO	1.025	**ACCEPT**
AVERAGE dH@ =	**1.687**				
Average dH@ Range =		1.487	TO	1.887	**ACCEPT**

Calculations

$Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw + 460))$

$dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw + 460) * t) / Vw)^2$

ENVIRONMENTAL QUALITY MANAGEMENT

Meter Box:	2	Bar. Press.(Pb):	30.20	in. Hg
Date:	September 21, 2016	Pretest Gamma:	1.005	
Calibrated By :	BF	Pretest dH@:	1.687	
Plant:	AK Middletown ICR			

		RUN 1	RUN 2	RUN 3
DH	Delta H	1.70	1.70	1.70
in Hg	Vacuum	10.00	10.00	10.00
Vw_1	Initial RTM	815.108	834.195	851.095
Vw_2	Final RTM	834.195	851.095	869.481
Vd_1	Initial DGM	92.059	111.184	128.072
Vd_2	Final DGM	111.184	128.072	146.353
Tw	Ave. Temp RTM °F	77.5	82.0	84.0
Td	Ave. Temp DGM °F	68.5	70.5	72.0
t	Time (min.)	26.5	23.5	25.5
$Vw_2 - Vw_1$	Net Volume RTM	19.087	16.900	18.386
$Vd_2 - Vd_1$	Net Volume DGM	19.125	16.888	18.281
	Y	0.977	0.975	0.980
	dH@	1.880	1.911	1.909

AVERAGE Y = **0.975**

% Difference from Yearly Y = **-2.950** **ACCEPT**

AVERAGE dH@ = **1.900**

Calculations

$Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw + 460))$

$dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw + 460) * time) / Vw)^2$

Posttest Dry Gas Meter Calibration Form (English Units)

ENVIRONMENTAL QUALITY MANAGEMENT

Box No.:	3	Bar. Press.(Pb):	29.99	in. Hg	
Date:	01/26/2016	Calibrated By :	BF		

		RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6
DH	Delta H	0.50	0.75	1.00	1.50	2.00	4.00
in Hg	Vacuum	10	10	10	10	10	10
Vw_1	Initial RTM	444.013	454.677	467.904	484.045	504.465	522.160
Vw_2	Final RTM	454.474	467.699	483.885	504.250	521.906	549.310
Vd_1	Initial DGM	341.794	352.359	365.433	381.412	401.652	419.242
Vd_2	Final DGM	352.148	365.236	381.250	401.453	418.989	446.270
Tw	Ave. Temp RTM °F	68	71	74	75	75	75
Td	Ave. Temp DGM °F	67	72	76	79	82	84
t	Time (min.)	27.0	27.0	29.0	30.5	23.0	25.5
$Vw_2 - Vw_1$	Net Volume RTM	10.461	13.022	15.981	20.205	17.441	27.150
$Vd_2 - Vd_1$	Net Volume DGM	10.354	12.877	15.817	20.041	17.337	27.028
	Y	1.007	1.011	1.013	1.013	1.013	1.011
	dH@	1.862	1.806	1.848	1.915	1.943	1.964

AVERAGE Y =	**1.009**	(Reference meter correction factor of 0.9979)			
Average Y Range =		0.989	TO	1.029	**ACCEPT**
AVERAGE dH@ =	**1.890**				
Average dH@ Range =		1.690	TO	2.090	**ACCEPT**

Calculations

$Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw + 460))$

$dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw + 460) * t) / Vw)^2$

ENVIRONMENTAL QUALITY MANAGEMENT

Meter Box:	3	Bar. Press.(Pb):	30.13	in. Hg
Date:	September 20, 2016	Pretest Gamma:	1.009	
Calibrated By :	BF	Pretest dH@:	1.890	
Plant:	AK Middletown ICR			

		RUN 1	RUN 2	RUN 3
DH	Delta H	1.90	1.90	1.90
in Hg	Vacuum	10.00	10.00	10.00
Vw_1	Initial RTM	832.289	852.041	869.534
Vw_2	Final RTM	852.041	869.534	897.428
Vd_1	Initial DGM	429.134	448.755	466.176
Vd_2	Final DGM	448.755	466.176	494.087
Tw	Ave. Temp RTM °F	72.0	74.5	75.5
Td	Ave. Temp DGM °F	75.0	72.5	87.0
t	Time (min.)	26.5	23.5	37.5
$Vw_2 - Vw_1$	Net Volume RTM	19.752	17.493	27.894
$Vd_2 - Vd_1$	Net Volume DGM	19.621	17.421	27.911
	Y	1.008	0.996	1.016
	dH@	1.903	1.936	1.894

AVERAGE Y = **1.004**

% Difference from Yearly Y = **-0.455** **ACCEPT**

AVERAGE dH@ = **1.911**

Calculations

Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw +460))

dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw +460) * time) / Vw)^2

Posttest Dry Gas Meter Calibration Form (English Units)

ENVIRONMENTAL QUALITY MANAGEMENT

Box No.:	5	Bar. Press.(Pb):	30.24	in. Hg	
Date:	01/08/2016	Calibrated By :	BF		

		RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6
DH	Delta H	0.50	0.75	1.00	1.50	2.00	4.00
in Hg	Vacuum	10	10	10	10	10	10
Vw_1	Initial RTM	754.542	764.887	777.082	790.827	807.485	826.087
Vw_2	Final RTM	764.648	776.828	790.660	807.269	825.798	852.168
Vd_1	Initial DGM	84.754	95.104	107.365	121.218	138.041	156.874
Vd_2	Final DGM	94.868	107.112	121.044	137.830	156.592	183.282
Tw	Ave. Temp RTM °F	67	67	67	67	66	68
Td	Ave. Temp DGM °F	66	69	70	71	73	75
t	Time (min.)	26.0	25.0	25.0	25.0	25.0	25.0
$Vw_2 - Vw_1$	Net Volume RTM	10.106	11.941	13.578	16.442	18.313	26.081
$Vd_2 - Vd_1$	Net Volume DGM	10.114	12.008	13.679	16.612	18.551	26.408
	Y	0.996	0.995	0.997	0.994	0.995	0.991
	dH@	1.830	1.811	1.859	1.901	2.030	2.006

AVERAGE Y =	**0.993**	(Reference meter correction factor of 0.9979)			
Average Y Range =		0.973	TO	1.013	**ACCEPT**
AVERAGE dH@ =	**1.906**				
Average dH@ Range =		1.706	TO	2.106	**ACCEPT**

Calculations

$Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw + 460))$

$dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw + 460) * t) / Vw)^2$

ENVIRONMENTAL QUALITY MANAGEMENT

Meter Box:	5	Bar. Press.(Pb):	30.13	in. Hg
Date:	September 20,2016	Pretest Gamma:	0.993	
Calibrated By :	BF	Pretest dH@:	1.906	
Plant:	AK Middletown ICR			

		RUN 1	RUN 2	RUN 3
DH	Delta H	1.90	1.90	1.90
in Hg	Vacuum	10.00	10.00	10.00
Vw_1	Initial RTM	443.490	463.586	480.387
Vw_2	Final RTM	463.586	480.387	494.716
Vd_1	Initial DGM	984.057	1004.092	1020.765
Vd_2	Final DGM	1004.092	1020.765	1034.870
Tw	Ave. Temp RTM °F	75.0	81.5	86.0
Td	Ave. Temp DGM °F	71.0	73.5	74.5
t	Time (min.)	27.5	23.0	19.5
$Vw_2 - Vw_1$	Net Volume RTM	20.096	16.801	14.329
$Vd_2 - Vd_1$	Net Volume DGM	20.035	16.673	14.105
	Y	0.991	0.988	0.990
	dH@	2.018	2.059	2.065

AVERAGE Y = **0.988**

% Difference from Yearly Y = **-0.543** **ACCEPT**

AVERAGE dH@ = **2.047**

Calculations

$Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw + 460))$

$dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw + 460) * time) / Vw)^2$

Posttest Dry Gas Meter Calibration Form (English Units)

ENVIRONMENTAL QUALITY MANAGEMENT

Box No.:	11	Bar. Press.(Pb):	30.22	in. Hg	
Date:	December 30, 2015	Calibrated By :	BF		

		RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6
DH	Delta H	0.50	0.75	1.00	1.50	2.00	4.00
in Hg	Vacuum	10	10	10	10	10	10
Vw_1	Initial RTM	540.469	550.679	563.459	578.412	596.004	615.600
Vw_2	Final RTM	550.527	562.897	578.163	595.867	615.156	642.405
Vd_1	Initial DGM	278.965	289.097	301.826	316.756	334.403	354.130
Vd_2	Final DGM	288.949	301.255	316.510	334.265	353.690	381.159
Tw	Ave. Temp RTM °F	69	69	69	69	69	70
Td	Ave. Temp DGM °F	69	73	78	81	83	86
t	Time (min.)	25.0	25.0	26.5	26.0	25.0	25.0
$Vw_2 - Vw_1$	Net Volume RTM	10.058	12.218	14.704	17.455	19.152	26.805
$Vd_2 - Vd_1$	Net Volume DGM	9.984	12.158	14.684	17.509	19.287	27.029
	Y	1.005	1.011	1.016	1.016	1.013	1.012
	dH@	1.716	1.729	1.772	1.806	1.844	1.876

AVERAGE Y =	**1.010**	(Reference meter correction factor of 0.9979)			
Average Y Range =		0.990	TO	1.030	**ACCEPT**
AVERAGE dH@ =	**1.791**				
Average dH@ Range =		1.591	TO	1.991	**ACCEPT**

Calculations

$Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw + 460))$

$dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw + 460) * t) / Vw)^2$

ENVIRONMENTAL QUALITY MANAGEMENT

Meter Box:	11	Bar. Press.(Pb):	30.20	in. Hg
Date:	September 21, 2016	Pretest Gamma:	1.010	
Calibrated By :	BF	Pretest dH@:	1.791	
Plant:	Ak Middletown ICR			

		RUN 1	RUN 2	RUN 3
DH	Delta H	1.80	1.80	1.80
in Hg	Vacuum	10.00	10.00	10.00
Vw_1	Initial RTM	626.676	644.902	661.703
Vw_2	Final RTM	644.902	661.703	688.444
Vd_1	Initial DGM	147.153	165.469	182.282
Vd_2	Final DGM	165.469	182.282	208.942
Tw	Ave. Temp RTM °F	75.0	81.5	86.0
Td	Ave. Temp DGM °F	71.5	73.0	74.5
t	Time (min.)	25.0	23.0	36.5
$Vw_2 - Vw_1$	Net Volume RTM	18.226	16.801	26.741
$Vd_2 - Vd_1$	Net Volume DGM	18.316	16.813	26.660
	Y	0.984	0.979	0.978
	dH@	1.914	1.948	1.963

AVERAGE Y =	**0.978**	
% Difference from Yearly Y =	**-3.135**	**ACCEPT**
AVERAGE dH@ =	**1.942**	

Calculations

$Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw + 460))$

$dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw + 460) * time) / Vw)^2$

Posttest Dry Gas Meter Calibration Form (English Units)

ENVIRONMENTAL QUALITY MANAGEMENT

Box No.:	13	Bar. Press.(Pb):	30.22	in. Hg
Date:	12/30/2015	Calibrated By :	NP/EZ	

		RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6
DH	Delta H	0.50	0.75	1.00	1.50	2.00	4.00
in Hg	Vacuum	10	10	10	10	10	10
Vw_1	Initial RTM	642.983	652.972	666.164	680.190	698.497	718.536
Vw_2	Final RTM	652.972	665.432	680.190	697.497	717.788	746.718
Vd_1	Initial DGM	4.031	14.014	27.228	41.318	59.876	80.121
Vd_2	Final DGM	14.014	26.493	41.318	58.876	79.362	108.770
Tw	Ave. Temp RTM °F	70	69	74	77	70	70
Td	Ave. Temp DGM °F	66	69	74	70	78	81
t	Time (min.)	25.0	25.0	25.0	26.0	25.0	25.0
$Vw_2 - Vw_1$	Net Volume RTM	9.989	12.460	14.026	17.307	19.291	28.182
$Vd_2 - Vd_1$	Net Volume DGM	9.983	12.479	14.090	17.558	19.486	28.649
	Y	0.992	0.997	0.993	0.969	1.000	0.994
	dH@	1.754	1.675	1.780	1.932	1.840	1.714

AVERAGE Y =	**0.989**	(Reference meter correction factor of 0.9979)			
Average Y Range =		0.969	TO	1.009	**ACCEPT**
AVERAGE dH@ =	**1.783**				
Average dH@ Range =		1.583	TO	1.983	**ACCEPT**

Calculations

$Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw + 460))$

$dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw + 460) * t) / Vw)^2$

ENVIRONMENTAL QUALITY MANAGEMENT

Meter Box:	13	Bar. Press.(Pb):	30.13	in. Hg
Date:	September 20, 2016	Pretest Gamma:	0.989	
Calibrated By :	BF	Pretest dH@:	1.783	
Plant:	AK Middletown ICR			

		RUN 1	RUN 2	RUN 3
DH	Delta H	1.80	1.80	1.80
in Hg	Vacuum	10.00	10.00	10.00
Vw_1	Initial RTM	799.662	814.322	833.764
Vw_2	Final RTM	814.322	833.764	853.297
Vd_1	Initial DGM	35.806	50.501	69.887
Vd_2	Final DGM	50.501	69.887	89.235
Tw	Ave. Temp RTM °F	63.5	81.5	86.5
Td	Ave. Temp DGM °F	72.5	75.0	75.5
t	Time (min.)	20.0	26.5	26.5
$Vw_2 - Vw_1$	Net Volume RTM	14.660	19.442	19.533
$Vd_2 - Vd_1$	Net Volume DGM	14.695	19.386	19.348
	Y	1.010	0.987	0.985
	dH@	1.814	1.928	1.944

AVERAGE Y = **0.992**

% Difference from Yearly Y = **0.287** **ACCEPT**

AVERAGE dH@ = **1.895**

Calculations

$Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw + 460))$

$dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw + 460) * time) / Vw)^2$

Posttest Dry Gas Meter Calibration Form (English Units)

ENVIRONMENTAL QUALITY MANAGEMENT

Date: 9/23/2016
Vost Box Number: VB-1

Flow Rate: **1.0 l/min**
Rotameter Setting: **1.0 l/min**
Bubble Meter Temp. : 70

Run 1			
Bubble Meter		Meter Box	
1	1018.3	Initial Volume	7865.00
2	1017.90	Final Volume	7886.38
3	1017.8	Initial Temp.	69
4	1017	Final Temp.	75
5	1018.5	Average Temp.	72
6	1020.2	Time:	20
7	1019.2	QDGM=	1064.981
Average:	**1018.41**	Y=	**0.9563**

Run 2			
Bubble Meter		Meter Box	
1	1011.70	Initial Volume	7886.38
2	1009.90	Final Volume	7907.72
3	1008.2	Initial Temp.	75
4	1007.3	Final Temp.	79
5	1006.9	Average Temp.	77
6	1006.8	Time:	20
7	1005.4	QDGM=	1053.091
Average:	**1008.03**	Y=	**0.9572**

Run 3			
Bubble Meter		Meter Box	
1	1009.40	Initial Volume	7907.72
2	1008.40	Final Volume	7929.23
3	1007.10	Initial Temp.	79
4	1006.40	Final Temp.	81
5	1007.00	Average Temp.	80
6	1005.60	Time:	20
7	1004.70	QDGM=	1055.583
Average:	**1006.94**	Y=	**0.9539**

$QDGM = (((Vm_2 - Vm_1) * TBm°R) / (Tm°R * Time)) * 1000$

Y = Bm Average / QDGM

Average Y=	**0.9558**

ENVIRONMENTAL QUALTIY MANAGEMENT

Date: 9/23/2016
Vost Box Number: VB-2

Flow Rate: **1.0 l/min**
Rotameter Setting: **1.0 l/min**
Bubble Meter Temp. : 70

Run 1			
Bubble Meter		Meter Box	
1	949.9	Initial Volume	4935.50
2	949.9	Final Volume	4954.40
3	972.9	Initial Temp.	75
4	971.7	Final Temp.	77
5	980.1	Average Temp.	76
6	979.1	Time:	21
7	950.5	QDGM=	889.925
Average:	**964.87**	Y=	**1.0842**

Run 2			
Bubble Meter		Meter Box	
1	1008.6	Initial Volume	4954.40
2	1009.9	Final Volume	4975.10
3	1009.8	Initial Temp.	77
4	1003	Final Temp.	80
5	1004.5	Average Temp.	78.5
6	1006.6	Time:	22
7	1003.2	QDGM=	926.057
Average:	**1006.51**	Y=	**1.0869**

Run 3			
Bubble Meter		Meter Box	
1	1028.50	Initial Volume	4975.10
2	1029.70	Final Volume	4996.41
3	1030.00	Initial Temp.	80
4	1029.70	Final Temp.	81
5	1029.80	Average Temp.	80.5
6	1030.20	Time:	22
7	1028.90	QDGM=	949.819
Average:	**1029.54**	Y=	**1.0839**

$QDGM = (((Vm_2 - Vm_1) * TBm°R) / (Tm°R * Time)) * 1000$

Y = Bm Average / QDGM

Average Y=	**1.0850**

DIGITAL INDICATORS FOR THERMOCOUPLE READOUT

A digital indicator is calibrated by feeding a series of millivolt signals to the input and comparing the indicator reading with the reading the signal should have generated. Errors did not exceed 0.5 percent when the temperatures were expressed in degrees Rankine. Calibration data are included in the following Thermocouple Digital Indicator Calibration Data Sheet(s).

ENVIRONMENTAL QUALITY MANAGEMENT

THERMOCOUPLE DIGITAL INDICATOR
CALIBRATION DATA SHEET

DATE: 28-Dec-15 INDICATOR NO.: MB-2

OPERATOR: BF SERIAL NO.: 10285505

CALIBRATION DEVI Thermocouple Simulator MANUFACTURER: Omega

TEST POINT NO.	MILLIVOLT SIGINAL	EQUIVALENT TEMP, °F	DIGITAL INDICATOR TEMP READING, °F	DIFFERENCE, %
1	0	0	0	0.0
2	100	100	98	0.4
3	200	200	200	0.0
4	300	300	300	0.0
5	400	400	397	0.3
6	500	500	497	0.3
7	1000	1000	1001	0.1
8	1300	1300	1300	0.0
9	1600	1600	1601	0.0
10	1900	1900	1901	0.0

Percent difference must be less than or equal to 0.5 %

Percent difference: $\frac{(\text{Equivalent Temp,.}^{\circ}\text{R} - \text{Digital Indicator Temp., }^{\circ}\text{R}) * (100\%)}{(\text{Equivalent Temp., }^{\circ}\text{R})}$

Where $^{\circ}R = {}^{\circ}F + 460$

ACCEPT

ENVIRONMENTAL QUALITY MANAGEMENT

THERMOCOUPLE DIGITAL INDICATOR
CALIBRATION DATA SHEET

DATE: 23-Dec-15 INDICATOR NO.: MB-3

OPERATOR: BF SERIAL NO.: 10285505

CALIBRATION DEVI Thermocouple Simulator MANUFACTURER: Omega

TEST POINT NO.	MILLIVOLT SIGINAL	EQUIVALENT TEMP, °F	DIGITAL INDICATOR TEMP READING, °F	DIFFERENCE, %
1	0	0	0	0.0
2	100	100	98	0.4
3	200	200	201	0.2
4	300	300	300	0.0
5	400	400	397	0.3
6	500	500	498	0.2
7	1000	1000	1003	0.2
8	1300	1300	1303	0.2
9	1600	1600	1604	0.2
10	1900	1900	1904	0.2

Percent difference must be less than or equal to 0.5 %

Percent difference: $\frac{(\text{Equivalent Temp,.}^{\circ}\text{R} - \text{Digital Indicator Temp., }^{\circ}\text{R}) * (100\%)}{(\text{Equivalent Temp., }^{\circ}\text{R})}$

Where $^{\circ}\text{R} = {}^{\circ}\text{F} + 460$

ACCEPT

ENVIRONMENTAL QUALITY MANAGEMENT

THERMOCOUPLE DIGITAL INDICATOR
CALIBRATION DATA SHEET

DATE: 28-Dec-15 INDICATOR NO.: MB5

OPERATOR: CJ SERIAL NO.: 10285505

CALIBRATION DEVI Thermocouple Simulator MANUFACTURER: Omega

TEST POINT NO.	MILLIVOLT SIGINAL	EQUIVALENT TEMP, °F	DIGITAL INDICATOR TEMP READING, °F	DIFFERENCE, %
1	0	0	-1	0.2
2	100	100	98	0.4
3	200	200	200	0.0
4	300	300	299	0.1
5	400	400	396	0.5
6	500	500	496	0.4
7	1000	1000	1000	0.0
8	1300	1300	1299	0.1
9	1600	1600	1599	0.0
10	1900	1900	1899	0.0

Percent difference must be less than or equal to 0.5 %

Percent difference: $\frac{\text{(Equivalent Temp,.°R - Digital Indicator Temp., °R) * (100\%)}}{\text{(Equivalent Temp., °R)}}$

Where °R = °F + 460

ACCEPT

ENVIRONMENTAL QUALITY MANAGEMENT

THERMOCOUPLE DIGITAL INDICATOR
CALIBRATION DATA SHEET

DATE: 28-Dec-15 INDICATOR NO.: MB11

OPERATOR: CJ SERIAL NO.: 10285505

CALIBRATION DEVI Thermocouple Simulator MANUFACTURER: Omega

TEST POINT NO.	MILLIVOLT SIGINAL	EQUIVALENT TEMP, °F	DIGITAL INDICATOR TEMP READING, °F	DIFFERENCE, %
1	0	0	0	0.0
2	100	100	98	0.4
3	200	200	201	0.2
4	300	300	300	0.0
5	400	400	398	0.2
6	500	500	497	0.3
7	1000	1000	1003	0.2
8	1300	1300	1302	0.1
9	1600	1600	1604	0.2
10	1900	1900	1903	0.1

Percent difference must be less than or equal to 0.5 %

Percent difference: $\frac{\text{(Equivalent Temp,.°R - Digital Indicator Temp., °R) * (100\%)}}{\text{(Equivalent Temp., °R)}}$

Where °R = °F + 460

ACCEPT

ENVIRONMENTAL QUALITY MANAGEMENT

THERMOCOUPLE DIGITAL INDICATOR
CALIBRATION DATA SHEET

DATE: 28-Dec-15 INDICATOR NO.: MB13

OPERATOR: CJ SERIAL NO.: 10285505

CALIBRATION DEVI Thermocouple Simulator MANUFACTURER: Omega

TEST POINT NO.	MILLIVOLT SIGINAL	EQUIVALENT TEMP, °F	DIGITAL INDICATOR TEMP READING, °F	DIFFERENCE, %
1	0	0	-1	0.2
2	100	100	98	0.4
3	200	200	200	0.0
4	300	300	299	0.1
5	400	400	398	0.2
6	500	500	497	0.3
7	1000	1000	1002	0.1
8	1300	1300	1302	0.1
9	1600	1600	1604	0.2
10	1900	1900	1903	0.1

Percent difference must be less than or equal to 0.5 %

Percent difference: $\frac{(\text{Equivalent Temp,.}^{\circ}\text{R} - \text{Digital Indicator Temp.,}\ ^{\circ}\text{R}) * (100\%)}{(\text{Equivalent Temp.,}\ ^{\circ}\text{R})}$

Where $^{\circ}\text{R} = {}^{\circ}\text{F} + 460$

ACCEPT

ENVIRONMENTAL QUALITY MANAGEMENT

THERMOCOUPLE DIGITAL INDICATOR
CALIBRATION DATA SHEET

DATE: 28-Jan-16 INDICATOR NO.: VB-1

OPERATOR: BF SERIAL NO.: 10285505

CALIBRATION DEVICE: Thermocouple Simulator MANUFACTURER: Omega

TEST POINT NO.	MILLIVOLT SIGINAL	EQUIVALENT TEMP, °F	DIGITAL INDICATOR TEMP READING, °F	DIFFERENCE, %
1	-0.692	0	-1	0.2
2	1.520	100	98	0.4
3	3.819	200	198	0.3
4	6.092	300	297	0.4
5	8.314	400	396	0.5
6	10.560	500	497	0.3
7	22.251	1000	999	0.1
8	29.315	1300	1297	0.2
9	36.166	1600	1598	0.1
10	42.732	1900	1900	0.0

Percent difference must be less than or equal to 0.5 %

Percent difference: $\frac{\text{(Equivalent Temp,. °R - Digital Indicator Temp., °R) * (100\%)}}{\text{(Equivalent Temp., °R)}}$

Where °R = °F + 460

ACCEPT

ENVIRONMENTAL QUALITY MANAGEMENT

THERMOCOUPLE DIGITAL INDICATOR
CALIBRATION DATA SHEET

DATE: 28-Jan-16 INDICATOR NO.: VB-2

OPERATOR: BF SERIAL NO.: 10285505

CALIBRATION DEVICE: Thermocouple Simulator MANUFACTURER: Omega

TEST POINT NO.	MILLIVOLT SIGINAL	EQUIVALENT TEMP, °F	DIGITAL INDICATOR TEMP READING, °F	DIFFERENCE, %
1	-0.692	0	-1	0.2
2	1.520	100	98	0.4
3	3.819	200	198	0.3
4	6.092	300	297	0.4
5	8.314	400	397	0.3
6	10.560	500	497	0.3
7	22.251	1000	999	0.1
8	29.315	1300	1297	0.2
9	36.166	1600	1598	0.1
10	42.732	1900	1897	0.1

Percent difference must be less than or equal to 0.5 %

Percent difference: $\frac{\text{(Equivalent Temp,.°R - Digital Indicator Temp., °R) * (100\%)}}{\text{(Equivalent Temp., °R)}}$

Where °R = °F + 460

ACCEPT

DRY GAS THERMOCOUPLES AND IMPINGER THERMOCOUPLES

The dry gas thermocouples are calibrated by comparing them with an ASTM-3 thermometer at approximately 32°F, ambient temperature, and a higher temperature between approximately 100°F and 200°F. The thermocouples agreed within 5°F of the reference thermometer. The impinger thermocouples are checked in a similar manner at approximately 32°F and ambient temperature, and they agreed within 2°F. The thermocouples may be checked at ambient temperature prior to the test series to verify calibration. Calibration data are included in the following Dry Gas Thermometer and Impinger Thermocouple Calibration Data Sheet(s).

ENVIRONMENTAL QUALITY MANAGEMENT

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR METER BOX

DATE: 28-Dec-15 **THERMOCOUPLE NUMBER:** MB2

AMBIENT TEMPERATURE: 68 °F **BAROMETRIC PRES.(In.Hg):** 30.11

CALIBRATOR: BF

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature, °F	Thermocouple Potentiometer Temperature, °F	Temperature Difference,[b] °F
Inlet				
1	Ambient Air	68	66	2
2	Cold Bath	36	34	2
3	Hot Bath	212	210	2
Outlet				
1	Ambient Air	68	65	3
2	Cold Bath	36	37	1
3	Hot Bath	212	211	1

ACCEPT

[a]Type of calibration used.

[b]Allowable tolerance ±5°F

Comments:

ENVIRONMENTAL QUALITY MANAGEMENT

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR METER BOX

DATE: 23-Dec-15 **THERMOCOUPLE NUMBER:** MB3

AMBIENT TEMPERATURE: 67.5 °F **BAROMETRIC PRES.(In.Hg):** 29.85

CALIBRATOR: BF

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature,°F	Thermocouple Potentiometer Temperature,°F	Temperature Difference,[b] °F
Inlet				
1	Ambient Air	67.5	68	0.5
2	Cold Bath	34	33	1
3	Hot Bath	212	213	1
Outlet				
1	Ambient Air	67.5	69	1.5
2	Cold Bath	34	36	2
3	Hot Bath	212	210	2

ACCEPT

[a]Type of calibration used.

[b]Allowable tolerance ±5°F

Comments:

ENVIRONMENTAL QUALITY MANAGEMENT

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR METER BOX

DATE: 28-Dec-15 **THERMOCOUPLE NUMBER:** MB5

AMBIENT TEMPERATURE: 68 °F **BAROMETRIC PRES.(In.Hg):** 30.11

CALIBRATOR: BF

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature, °F	Thermocouple Potentiometer Temperature, °F	Temperature Difference,[b] °F
Inlet				
1	Ambient Air	68	67	1
2	Cold Bath	34	35	1
3	Hot Bath	212	211	1
Outlet				
1	Ambient Air	68	66	2
2	Cold Bath	34	35	1
3	Hot Bath	212	209	3

ACCEPT

[a]Type of calibration used.

[b]Allowable tolerance ±5°F

Comments:

ENVIRONMENTAL QUALITY MANAGEMENT

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR METER BOX

DATE: 28-Dec-15 **THERMOCOUPLE NUMBER:** MB11

AMBIENT TEMPERATURE: 68 °F **BAROMETRIC PRES.(In.Hg):** 30.11

CALIBRATOR: BF

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature, °F	Thermocouple Potentiometer Temperature, °F	Temperature Difference,[b] °F
Inlet				
1	Ambient Air	68	67	1
2	Cold Bath	36	36	0
3	Hot Bath	212	209	3
Outlet				
1	Ambient Air	68	66	2
2	Cold Bath	36	36	0
3	Hot Bath	212	214	2

ACCEPT

[a]Type of calibration used.

[b]Allowable tolerance ±5°F

Comments:

ENVIRONMENTAL QUALITY MANAGEMENT

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR METER BOX

DATE: 28-Dec-15 **THERMOCOUPLE NUMBER:** MB13

AMBIENT TEMPERATURE: 68 °F **BAROMETRIC PRES.(In.Hg):** 30.11

CALIBRATOR: BF

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature, °F	Thermocouple Potentiometer Temperature, °F	Temperature Difference,[b] °F
Inlet				
1	Ambient Air	68	66	2
2	Cold Bath	36	35	1
3	Hot Bath	212	210	2
Outlet				
1	Ambient Air	68	66	2
2	Cold Bath	36	37	1
3	Hot Bath	212	211	1

ACCEPT

[a]Type of calibration used.

[b]Allowable tolerance ±5°F

Comments:

ENVIRONMENTAL QUALTIY MANAGEMENT

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR METER BOX

DATE: 27-Jan-16 **THERMOCOUPLE NUMBER:** VB-1

AMBIENT TEMPERATURE: 65.5 °F **BAROMETRIC PRES.(In.Hg):** 30.20

CALIBRATOR: Npharo

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature, °F	Thermocouple Potentiometer Temperature, °F	Temperature Difference,[b] °F
Inlet 1	Ambient Air	65.5	65.4	0.1
2	Cold Bath	39	38.5	0.5
3	Hot Bath	212	209.3	2.7
Outlet 1	Ambient Air	65.5	65.4	0.1
2	Cold Bath	39	39.4	0.4
3	Hot Bath	212	211.8	0.2

ACCEPT

[a]Type of calibration used.

[b]Allowable tolerance ±5°F

Comments:

ENVIRONMENTAL QUALITY MANAGEMENT

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR METER BOX

DATE: 27-Jan-16 **THERMOCOUPLE NUMBER:** VB-2

AMBIENT TEMPERATURE: 65.8 °F **BAROMETRIC PRES.(In.Hg):** 30.20

CALIBRATOR: Npharo

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature,°F	Thermocouple Potentiometer Temperature,°F	Temperature Difference,[b] °F
Inlet 1	Ambient Air	65.8	65.2	0.6
2	Cold Bath	39	37.5	1.5
3	Hot Bath	212	214.5	2.5
Outlet 1	Ambient Air	65.8	64.9	0.9
2	Cold Bath	39	39.1	0.1
3	Hot Bath	212	212.7	0.7

ACCEPT

[a]Type of calibration used.

[b]Allowable tolerance ±5°F

Comments:

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR SAMPLE HEADS

12/28/2015

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature,°F	Thermocouple Potentiometer Temperature,°F	Temperature Difference,[b] °F	
Sample Head No. 1					
1	Ambient Air	65.7	66.6	0.9	ACCEPT
2	Cold Bath	34	33.5	-0.5	
Sample Head No. 2					
1	Ambient Air	65.7	66.6	0.9	ACCEPT
2	Cold Bath	34	32.9	-1.1	
Sample Head No. 3					
1	Ambient Air	65.7	66.4	0.7	ACCEPT
2	Cold Bath	34	33.1	-0.9	
Sample Head No. 4					
1	Ambient Air	65.7	66.5	0.8	ACCEPT
2	Cold Bath	34	33.3	-0.7	
Sample Head No. 5					
1	Ambient Air	65.7	67.1	1.4	ACCEPT
2	Cold Bath	34	32.7	-1.3	
Sample Head No. 6					
1	Ambient Air	N/A	N/A	N/A	N/A
2	Cold Bath	N/A	N/A	N/A	
Sample Head No. 7					
1	Ambient Air	65.7	66.2	0.5	ACCEPT
2	Cold Bath	34	32.9	-1.1	
Sample Head No. 8					
1	Ambient Air	65.7	66.3	0.6	ACCEPT
2	Cold Bath	34	32.7	-1.3	
Sample Head No. 9					
1	Ambient Air	65.7	66.5	0.8	ACCEPT
2	Cold Bath	34	32.7	-1.3	
Sample Head No. 10					
1	Ambient Air	65.7	66.5	0.8	ACCEPT
2	Cold Bath	34	32.9	-1.1	
Sample Head No. 11					
1	Ambient Air	65.7	66.5	0.8	ACCEPT
2	Cold Bath	34	32.7	-1.3	
Sample Head No. 12					
1	Ambient Air	65.7	66.4	0.7	ACCEPT
2	Cold Bath	34	32.7	-1.3	
Sample Head No. 13					
1	Ambient Air	65.7	66.2	0.5	ACCEPT
2	Cold Bath	34	33.3	-0.7	

[a]Type of calibration used.
[b]Allowable tolerance ±2°F

Calibrated By: EZ

STACK THERMOCOUPLES

Each thermocouple is calibrated by comparing it with an ASTM-3F thermometer at approximately 32°F, ambient temperature, 212°F, and 500°F. The thermocouple reads within 1.5 percent of the reference thermometer throughout the entire range when expressed in degrees Rankine. The thermocouples may be checked at ambient temperature at the test site to verify the calibration. Calibration data are included in the following Thermocouple Calibration Data Sheet(s).

2016 YEARLY THERMOCOUPLE CALIBRATIONS

Thermo.	Therm.	Date	Ambient	Diff., %	Cold Bath	Diff., %	Hot Bath	Diff., %	Hot Oil	Diff., %	Accept/Reject
T2-1	Reference	12/21/2015	69.1	0.00	34	0.02	214	0.22	396	0.06	ACCEPT
	Pitot		69.1		34.1		212.5		395.5		
P2-2	Reference	12/21/2015	68.9	0.30	34	0.04	214	0.03	422	0.23	ACCEPT
	Pitot		67.3		33.8		213.8		420		
T2-2	Reference	12/21/2015	69	0.36	34	0.47	216	0.31	389	0.20	ACCEPT
	Pitot		67.1		36.3		213.9		387.3		
T2-3	Reference	12/21/2015	68.9	0.19	34	0.18	216	0.21	440	0.78	ACCEPT
	Pitot		67.9		34.9		214.6		433		
T2-4	Reference	12/21/2015	68.7	0.30	34	0.20	214	0.04	408	0.15	ACCEPT
	Pitot		67.1		35		214.3		409.3		
T2-5	Reference	12/21/2015	68.9	0.79	36	0.14	218	0.07	403	0.10	ACCEPT
	Pitot		64.7		35.3		217.5		402.1		
T2-6	Reference	12/21/2015	69.5	0.23	34	0.06	216	0.40	360	0.61	ACCEPT
	Pitot		68.3		33.7		213.3		355		
T2-7	Reference	12/28/2015	65.5	0.08	35	0.00	212	0.16	320	0.01	ACCEPT
	Pitot		65.9		35		210.9		320.1		
T2-8	Reference	12/21/2015	68.6	0.17	34	0.12	214	0.22	404	0.39	ACCEPT
	Pitot		67.7		34.6		212.5		400.6		
T3-1	Reference	12/22/2015	65.9	0.57	37	0.06	214	0.25	350	0.27	ACCEPT
	Pitot		68.9		36.7		212.3		347.8		
T3-2	Reference	12/21/2015	68.5	0.04	35	0.10	217	0.65	402	0.01	ACCEPT
	Pitot		68.3		34.5		212.6		402.1		
T3-3P	Reference	12/29/2015	67.5	0.04	35	0.02	213	0.10	440	0.89	ACCEPT
	Pitot		67.3		34.9		212.3		432		
T3-4P	Reference	12/22/2015	68.5	0.08	33	0.18	214	0.18	374	0.14	ACCEPT
	Pitot		68.1		33.9		212.8		372.8		
T3-5	Reference	12/22/2015	66.1	0.49	38	0.30	212	0.06	366	0.04	ACCEPT
	Pitot		68.7		39.5		212.4		365.7		
T3-6	Reference	12/28/2015	65.8	0.02	36	0.02	212	0.16	373	0.28	ACCEPT
	Pitot		65.7		36.1		213.1		375.3		
T3-7	Reference	12/22/2015	67.9	0.17	36	0.12	218	0.74	319	0.41	ACCEPT
	Pitot		67		35.4		213		322.2		
T3-8	Reference	12/21/2015	68.9	0.28	34	0.14	214	0.07	440	0.64	ACCEPT
	Pitot		67.4		34.7		214.5		434.2		
T3-9I	Reference	12/22/2015	65.9	0.46	37	0.04	214	0.13	338	0.21	ACCEPT
	Pitot		68.3		36.8		213.1		336.3		
T3-10I	Reference	12/22/2015	69.5	0.23	37	0.28	214	0.06	332	0.29	ACCEPT
	Pitot		68.3		38.4		209.2		329.7		
T3-11	Reference	1/27/2016	65.2	0.06	38	0.14	212	0.06	380	0.17	ACCEPT
	Pitot		64.9		37.3		212.5		378.6		
T3-67	Reference	1/27/2016	65.3	0.06	34	0.22	212	0.12	340	0.28	ACCEPT
	Pitot		65		35.1		212.8		337.8		
T4-1	Reference	12/22/2015	69.2	0.17	36	0.06	216	0.19	320	0.22	ACCEPT
	Pitot		68.3		35.7		214.7		318.3		
T4-2	Reference	12/29/2015	67.3	0.04	34	0.02	212	0.04	330	0.04	ACCEPT
	Pitot		67.1		33.9		212.3		329.7		
T4-3	Reference	12/22/2015	66.7	0.04	35	0.08	213	0.22	360	0.06	ACCEPT
	Pitot		66.5		34.6		211.5		359.5		
T4-4P	Reference	12/22/2015	65.6	0.25	38	0.08	212	0.25	278	0.12	ACCEPT
	Pitot		66.9		38.4		210.3		277.1		
T4-5	Reference	12/22/2015	68.4	0.17	35	0.06	212	0.22	300	0.50	ACCEPT
	Pitot		67.5		35.3		210.5		296.2		
T4-6P	Reference	12/22/2015	66	0.25	35	0.14	214	0.27	340	0.04	ACCEPT
	Pitot		67.3		35.7		212.2		340.3		
T4-7	Reference	12/21/2015	69.9	0.32	36	0.22	218	0.88	436	0.52	ACCEPT
	Pitot		68.2		37.1		212		431.3		
T4-8	Reference	1/27/2016	65.3	0.02	32	0.22	212	0.04	332	0.21	ACCEPT
	Pitot		65.2		33.1		212.3		333.7		
T4-8P	Reference	12/22/2015	65.8	0.42	38	0.04	213	0.25	316	0.06	ACCEPT
	Pitot		68		38.2		211.3		315.5		
T4-9	Reference	12/28/2015	65.8	0.02	36	0.06	212	0.01	373	0.20	ACCEPT
	Pitot		65.9		36.3		212.1		374.7		

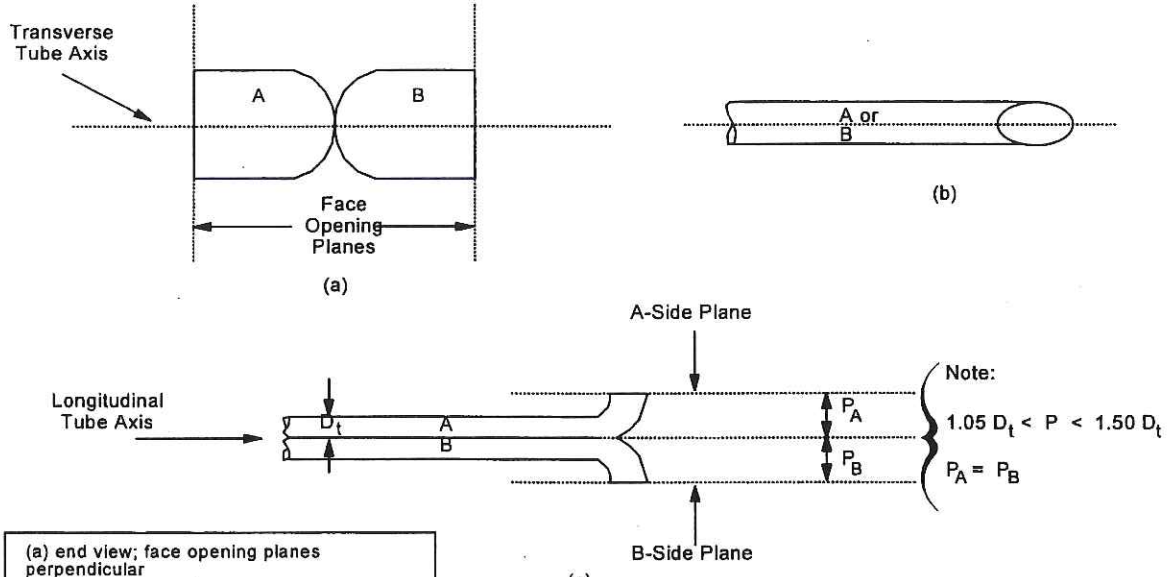
Thermo.	Therm.	Date	Ambient	Diff., %	Cold Bath	Diff., %	Hot Bath	Diff., %	Hot Oil	Diff., %	Accept/Reject
T4-10	Reference	1/27/2016	64.9	0.21	38	0.22	212	0.28	380	0.43	ACCEPT
	Pitot		63.8		39.1		210.1		376.4		
T4-13	Reference	12/29/2015	67.3	0.02	34	0.02	212	0.06	356	0.16	ACCEPT
	Pitot		67.2		34.1		212.4		354.7		
T4-14	Reference	12/29/2015	67.3	0.02	34	0.02	212	0.07	350	0.15	ACCEPT
	Pitot		67.2		33.9		212.5		348.8		
T4-15	Reference	12/22/2015	65.8	0.36	35	0.32	216	8.28	350	12.56	REJECT
	Pitot		67.7		36.6		160		248.3		
T4-16	Reference	12/21/2015	70.1	0.32	34	0.12	218	0.58	420	0.66	ACCEPT
	Pitot		68.4		34.6		214.1		425.8		
T4-17	Reference	1/27/2016	65.2	0.08	38	0.26	212	0.03	346	0.29	ACCEPT
	Pitot		65.6		39.3		211.8		348.3		
T5-1P	Reference	12/22/2015	67.3	0.15	34	0.08	212	0.01	356	0.16	ACCEPT
	Pitot		68.1		34.4		211.9		354.7		
T5-2	Reference	12/22/2015	67.3	0.44	36	0.34	213	0.12	360	0.05	ACCEPT
	Pitot		69.6		34.3		212.2		360.4		
T5-3P	Reference	12/22/2015	67.2	0.13	35	0.34	214	0.49	360	0.02	ACCEPT
	Pitot		67.9		36.7		210.7		359.8		
T5-4	Reference	12/23/2015	66.3	0.15	34	0.14	212	0.09	330	0.44	ACCEPT
	Pitot		67.1		34.7		212.6		326.5		
T5-7P	Reference	1/27/2016	65.3	0.17	38	0.24	212	0.10	340	0.34	ACCEPT
	Pitot		66.2		39.2		211.3		342.7		
T5-8	Reference	12/22/2015	67	0.02	34	0.04	214	0.04	360	0.16	ACCEPT
	Pitot		66.9		34.2		213.7		358.7		
T5-9	Reference	12/22/2015	67.2	0.36	34	0.08	212	0.22	344	0.44	ACCEPT
	Pitot		69.1		34.4		213.5		347.5		
T6-1	Reference	12/23/2015	67.5	0.08	35	0.04	212	0.07	370	0.31	ACCEPT
	Pitot		67.1		34.8		211.5		367.4		
T6-2	Reference	12/23/2015	64.7	0.06	38	0.04	212	0.15	354	0.02	ACCEPT
	Pitot		65		38.2		213		354.2		
T6-3	Reference	12/23/2015	66.1	0.04	34	0.16	212	0.07	364	0.18	ACCEPT
	Pitot		65.9		34.8		212.5		362.5		
T6-3P	Reference	12/28/2015	64.9	0.04	36	0.04	212	0.16	378	0.05	ACCEPT
	Pitot		65.1		35.8		210.9		378.4		
T6-5	Reference	12/22/2015	66.9	0.30	34	0.24	214	0.22	370	0.16	ACCEPT
	Pitot		68.5		32.8		212.5		371.3		
T6-5P	Reference	12/23/2015	67.3	0.02	34	0.06	212	0.12	352	0.70	ACCEPT
	Pitot		67.4		34.3		212.8		346.3		
T6-7	Reference	1/27/2016	65.3	0.08	38	0.16	212	0.03	390	0.39	ACCEPT
	Pitot		65.7		38.8		211.8		386.7		
T6-9	Reference	12/23/2015	67.5	0.04	36	0.06	212	0.03	366	0.06	ACCEPT
	Pitot		67.3		35.7		212.2		366.5		
T6-10	Reference	12/23/2015	67.3	0.04	34	0.14	212	0.03	366	0.22	ACCEPT
	Pitot		67.5		34.7		212.2		367.8		
T6-12P	Reference	12/23/2015	67.5	0.04	38	0.06	212	0.09	360	0.11	ACCEPT
	Pitot		67.3		38.3		212.6		360.9		
T6-13	Reference	12/23/2015	67.1	0.04	34	0.02	212	0.01	360	0.21	ACCEPT
	Pitot		66.9		33.9		211.9		361.7		
T6-14P	Reference	12/23/2015	64.8	0.06	38	0.04	212	0.21	390	0.09	ACCEPT
	Pitot		64.5		38.2		210.6		389.2		
T6-15P	Reference	12/28/2015	64.9	0.04	36	0.02	212	0.13	388	0.24	ACCEPT
	Pitot		65.1		35.9		211.1		386		
T7-1	Reference	12/28/2015	64.9	0.04	35	0.02	212	0.10	384	0.20	ACCEPT
	Pitot		65.1		35.1		212.7		382.3		
T7-2	Reference	12/22/2015	67	0.28	33	0.18	214	0.04	382	0.29	ACCEPT
	Pitot		68.5		33.9		214.3		384.4		
T7-4I	Reference	12/28/2015	65.1	0.02	34	0.06	212	0.22	364	0.15	ACCEPT
	Pitot		65.2		34.3		210.5		362.8		
T7-5I	Reference	12/28/2015	65.4	0.04	34	0.16	212	0.28	380	0.05	ACCEPT
	pitot		65.2		34.8		210.1		380.4		
T7-5	Reference	12/22/2015	66.9	0.32	32	0.16	214	0.04	366	0.54	ACCEPT
	Pitot		68.6		32.8		213.7		370.5		
T7-6I	Reference	12/28/2015	65.8	0.00	34	0.06	212	0.04	370	0.22	ACCEPT
	Pitot		65.8		34.3		212.3		368.2		
T8-1P	Reference	12/28/2015	65.6	0.08	34	0.06	212	0.19	380	0.36	ACCEPT
	Pitot		65.2		34.3		210.7		383		
T8-2	Reference	1/27/2016	65.7	0.13	39	0.72	212	0.04	338	0.66	ACCEPT
	Pitot		65		35.4		212.3		332.7		

Thermo.	Therm.	Date	Ambient	Diff., %	Cold Bath	Diff., %	Hot Bath	Diff., %	Hot Oil	Diff., %	Accept/Reject
T8-3	Reference	12/28/2015	65.1	0.02	39	0.04	212	0.06	360	0.21	ACCEPT
	Pitot		65		39.2		211.6		361.7		
T8-7	Reference	12/28/2015	65	0.02	36	0.06	212	0.21	388	0.20	ACCEPT
	Pitot		64.9		36.3		213.4		389.7		
T8-8P	Reference	12/28/2015	65.5	0.04	35	0.18	212	0.19	380	0.08	ACCEPT
	Pitot		65.3		35.9		210.7		379.3		
T8-9P	Reference	12/28/2015	65.7	0.10	36	0.04	212	0.25	384	0.21	ACCEPT
	Pitot		65.2		35.8		210.3		385.8		
T8-10	Reference	12/28/2015	66.2	0.02	35	0.12	212	0.13	390	0.25	ACCEPT
	Pitot		66.1		35.6		212.9		392.1		
T8-11	Reference	12/28/2015	65.6	0.08	35	0.02	212	0.03	382	0.10	ACCEPT
	Pitot		66		35.1		211.8		381.2		
T8-14	Reference	12/18/2014	66	0.11	36	0.22	212	0.16	385.1	0.24	ACCEPT
	Pitot		65.4		37.1		213.1		383.1		
8-18	Reference	12/28/2015	65.1	0.02	35	0.06	212	0.03	350	0.16	ACCEPT
	Pitot		65.2		34.7		212.2		348.7		
T8-19	Reference	12/28/2015	64.9	0.00	34	0.02	212	0.03	348	0.02	ACCEPT
	Pitot		64.9		34.1		212.2		347.8		
T8-20	Reference	12/28/2015	65.7	0.08	34	0.10	212	0.10	378	0.05	ACCEPT
	Pitot		66.1		34.5		212.7		378.4		
T8-21	Reference	12/28/2015	65	0.02	36	0.02	212	0.25	370	0.11	ACCEPT
	Pitot		65.1		36.1		213.7		370.9		
8-22	Reference	12/28/2015	65.1	0.04	34	0.02	212	0.13	350	0.12	ACCEPT
	Pitot		65.3		34.1		212.9		351		
8-23	Reference	12/28/2015	65.1	0.04	35	0.02	212	0.04	384	0.07	ACCEPT
	Pitot		65.3		35.1		212.3		384.6		
8-24	Reference	12/28/2015	65.8	0.00	35	0.08	212	0.03	368	0.52	ACCEPT
	Pitot		65.8		35.4		212.2		363.7		
T9-1	Reference	12/28/2015	65.8	0.06	38	0.14	212	0.12	378	0.07	ACCEPT
	Pitot		65.5		38.7		211.2		377.4		
T9-2	Reference	12/28/2015	65.9	0.06	37	0.06	212	0.06	380	0.04	ACCEPT
	Pitot		66.2		37.3		212.4		379.7		
10-1	Reference	12/28/2015	65.8	0.04	37	0.04	212	0.06	376	0.17	ACCEPT
	Pitot		66		36.8		212.4		377.4		
T10-2	Reference	12/28/2015	65.8	0.02	37	0.10	212	0.04	376	0.47	ACCEPT
	Pitot		65.9		37.5		212.3		372.1		
T10-2P	Reference	12/28/2015	65.8	0.02	38	0.06	212	0.06	354	0.10	ACCEPT
	Pitot		65.9		38.3		212.4		353.2		
T10-4	Reference	12/28/2015	65.8	0.06	38	0.06	212	0.04	350	0.20	ACCEPT
	Pitot		66.1		38.3		212.3		351.6		
T10-21	Reference	1/27/2016	65.6	0.08	38	0.22	212	0.13	390	0.27	ACCEPT
	Pitot		66		39.1		212.9		392.3		
T12-1	Reference	1/27/2016	65.3	0.17	38	0.14	212	0.12	346	0.46	ACCEPT
	Pitot		66.2		38.7		211.2		349.7		
T12-2	Reference	12/28/2015	65.8	0.02	34	0.16	212	0.04	370	0.28	ACCEPT
	Pitot		65.9		34.8		212.3		372.3		
T12-3	Reference	12/28/2015	65.8	0.04	35	0.06	212	0.03	370	0.19	ACCEPT
	Pitot		66		34.7		212.2		368.4		
T12-4	Reference	12/28/2015	65.8	0.04	34	0.04	212	0.12	376	0.28	ACCEPT
	Pitot		66		34.2		212.8		373.7		
T14-1	Reference	12/28/2015	65.8	0.02	36	0.02	212	0.06	375	0.02	ACCEPT
	Pitot		65.9		36.1		212.4		375.2		
T20-1	Reference	12/28/2015	65.8	0.04	36	0.04	212	0.06	372	0.37	ACCEPT
	Pitot		66		36.2		212.4		375.1		
DB-1	Reference	12/29/2015	66.6	0.17	32.3	0.00	212	0.21		0.00	ACCEPT
	Pitot		67.5		32.3		210.6				
WB-1	Reference	12/29/2015	66.6	0.02	32.3	0.08	212	0.31		0.00	ACCEPT
	Pitot		66.7		32.7		209.9				
DB-2	Reference	12/29/2015	66.8	0.23	32.3	0.04	212	0.31		0.00	ACCEPT
	Pitot		68		32.1		209.9				
WB-2	Reference	12/29/2015	66.8	0.23	32.3	0.04	212	0.43		0.00	ACCEPT
	Pitot		68		32.5		209.1				
DB-3	Reference	12/29/2015	66.9	0.30	32.3	0.00	212	0.16		0.00	ACCEPT
	Pitot		68.5		32.3		210.9				
WB-3	Reference	12/29/2015	66.9	0.30	32.3	0.00	212	0.21		0.00	ACCEPT
	Pitot		68.5		32.3		210.6				
DB-4	Reference	12/29/2015	66.8	0.32	32.3	0.08	212	0.22		0.00	ACCEPT
	Pitot		68.5		32.7		210.5				
WB-4	Reference	12/29/2015	66.8	0.23	32.3	0.02	212	0.19		0.00	ACCEPT
	Pitot		68		32.2		210.7				
DB-5	Reference	12/29/2015	67.2	0.21	32.3	0.04	212	0.16		0.00	ACCEPT
	Pitot		68.3		32.1		210.9				

Thermo.	Therm.	Date	Ambient	Diff., %	Cold Bath	Diff., %	Hot Bath	Diff., %	Hot Oil	Diff., %	Accept/Reject
WB-5	Reference	12/29/2015	67.2	0.17	32.3	0.04	212	0.15		0.00	ACCEPT
	Pitot		68.1		32.1		211				
DB-7	Reference	12/29/2015	67.2	0.17	32.3	0.12	212	0.22		0.00	ACCEPT
	Pitot		68.1		32.9		210.5				
WB-7	Reference	12/29/2015	67.2	0.17	32.3	0.08	212	0.25		0.00	ACCEPT
	Pitot		68.1		32.7		210.3				
DB-8	Reference	12/29/2015	67.3	0.19	32.3	0.16	212	0.33		0.00	ACCEPT
	Pitot		68.3		33.1		209.8				
WB-8	Reference	12/29/2015	67.3	0.23	32.3	0.14	212	0.25		0.00	ACCEPT
	Pitot		68.5		33		210.3				
4467	Reference	12/29/2015	66.9	0.15	33.5	0.16	212	0.22	370	0.36	ACCEPT
	Pitot		67.7		32.7		213.5		367		
4469	Reference	12/29/2015	66.9	0.38	33.5	0.06	212	0.22	378	0.24	ACCEPT
	Pitot		68.9		33.8		210.5		376		
4473	Reference	12/29/2015	66.9	0.15	33.5	0.08	212	0.01	360	0.12	ACCEPT
	Pitot		67.7		33.1		212.1		359		
LT1-2	Reference	1/27/2016	65.2	0.10	38	0.56	212	0.10	384	0.60	ACCEPT
	Pitot		65.7		40.8		211.3		389.1		
BH-1	Reference	12/29/2015	65.8	0.17	33.8	0.14	212	0.34		0	ACCEPT
	Pitot		64.9		33.1		209.7				
BH-2	Reference	12/29/2015	65.8	0.10	33.8	0.06	212	0.19		0	ACCEPT
	Pitot		66.3		33.5		210.7				
BH-4	Reference	12/29/2015	65.8	0.02	34	0.06	212	0.45		0	ACCEPT
	Pitot		65.9		33.7		209				
BH-5	Reference	12/29/2015	65.8	0.02	34	0.10	212	0.34		0	ACCEPT
	Pitot		65.9		33.5		214.3				
BH-6	Reference	12/29/2015	65.8	0.10	34	0.22	212	0.19		0	ACCEPT
	Pitot		66.3		32.9		210.7				
BH-7	Reference	12/29/2015	65.8	0.15	34	0.06	212	0.43		0	ACCEPT
	Pitot		66.6		33.7		209.1				
BH-8	Reference	12/29/2015	65.8	0.04	35	0.14	212	0.09		0	ACCEPT
	Pitot		66		34.3		211.4				
BH-9	Reference	12/29/2015	65.8	0.00	35.8	0.22	212	0.09		0	ACCEPT
	Pitot		65.8		34.7		211.4				
BH-10	Reference	12/29/2015	65.8	0.15	35.9	0.24	212	0.25		0	ACCEPT
	Pitot		66.6		34.7		213.7				
BH-11	Reference	12/29/2015	67.8	0.09	35.5	0.20	212	0.25		0	ACCEPT
	Pitot		67.3		34.5		210.3				
BH-13	Reference	12/29/2015	67.1	0.09	34.5	0.20	212	0.30		0	ACCEPT
	Pitot		67.6		33.5		210				
BH-14	Reference	12/29/2015	67	0.11	34.1	0.10	212	0.36		0	ACCEPT
	Pitot		67.6		33.6		209.6				
BH-15	Reference	12/29/2015	66.9	0.11	34.1	0.08	212	0.45		0	ACCEPT
	Pitot		67.5		33.7		209				
BH-16	Reference	12/29/2015	66.8	0.17	34.8	0.18	212	0.39		0	ACCEPT
	Pitot		67.7		33.9		209.4				
BH-17	Reference	12/29/2015	66.8	0.09	33.9	0.02	212	0.09		0	ACCEPT
	Pitot		67.3		34		211.4				
BH-18	Reference	12/29/2015	66.7	0.15	34.5	0.10	212	1.04		0	ACCEPT
	Pitot		67.5		34		205				
BH-19	Reference	12/29/2015	66.7	0.11	34.2	0.02	212	0.30		0	ACCEPT
	Pitot		67.3		34.1		210				
BH-20	Reference	12/29/2015	66.7	0.13	32.5	0.28	212	0.40		0	ACCEPT
	Pitot		67.4		33.9		209.3				
BH-21	Reference	12/29/2015	66.8	0.17	33	0.18	212	0.42		0	ACCEPT
	Pitot		67.7		33.9		209.2				
BH-22	Reference	12/29/2015	66.8	0.13	33.5	0.20	212	0.09		0	ACCEPT
	Pitot		67.5		34.5		211.4				
BH-23	Reference	12/29/2015	66.9	0.11	33.5	0.12	212	0.16		0	ACCEPT
	Pitot		67.5		34.1		210.9				
BH-24	Reference	12/29/2015	66.8	0.13	33.5	0.22	212	0.46		0	ACCEPT
	Pitot		67.5		34.6		208.9				
BH-25	Reference	12/29/2015	66.9	0.09	33.5	0.08	212	0.07		0	ACCEPT
	Pitot		67.4		33.1		211.5				

PITOT TUBE CALIBRATION

Each pitot tube used in sampling meets all requirements of EPA Method 2, Section 4.1.** Therefore, a baseline coefficient of 0.84 is assigned to each pitot tube. The following pages show the alignment requirements of Method 2 and the Pitot Tube Inspection Data Sheet(s) for each pitot tube used during the test program.



(a) end view; face opening planes perpendicular to transverse axis;

(b) top view; face opening planes parallel to longitudinal axis;

(c) side view; both legs of equal length and centerlines coincident, when viewed from both sides. Baseline coefficient values of 0.84 may be assigned to pitot tubes constructed this way

**40 CFR 60, Appendix A, July 1995

ENVIRONMENTAL QUALITY MANAGEMENT

PITOT TUBE CALIBRATIONS

Pitot ID	Date Calibrated	α_1	β_1	α_2	β_2	Y	θ	A	z	w	P_α	P_β	D_t	$A/2/D_t$	Accept/Reject
P1-1	12/16/2015	0.8	0.3	0.9	0.2	1.2	0.7	0.64	0.013	0.008	0.320	0.3215	0.248	1.290	ACCEPT
P1-2	12/16/2015	2.5	0.3	3.2	0.1	2.2	0.9	0.874	0.034	0.014	0.437	0.437	0.374	1.168	ACCEPT
T2-1	12/16/2015	1.6	0.5	1.6	0.4	0.9	0.3	0.948	0.015	0.005	0.474	0.474	0.375	1.264	ACCEPT
P2-2	12/16/2015	2.0	0.2	1.0	0.4	2.0	1.0	0.94	0.033	0.016	0.470	0.470	0.371	1.267	ACCEPT
T2-2	12/16/2015	3.9	0.9	4.2	0.8	1.7	1.4	0.819	0.024	0.020	0.410	0.410	0.375	1.092	ACCEPT
T2-3	12/16/2015	1.6	1.3	1.1	1.5	1.9	1.8	0.950	0.031	0.030	0.475	0.475	0.368	1.291	ACCEPT
T2-4	12/16/2015	0.7	0.2	0.7	0.1	0.5	0.9	0.828	0.007	0.013	0.414	0.414	0.366	1.131	ACCEPT
T2-5	12/16/2015	1.2	0.1	1.8	0.2	0.4	1.5	0.819	0.006	0.021	0.410	0.410	0.374	1.095	ACCEPT
T2-6	12/16/2015	0.4	0.8	1.2	0.8	2.3	1.1	0.846	0.034	0.016	0.423	0.423	0.373	1.134	ACCEPT
T2-7	12/16/2015	6.4	0.4	6.8	0.5	8.6	0.7	0.834	0.125	0.010	0.417	0.417	0.375	1.112	ACCEPT
T2-8	12/16/2015	6.8	0.8	7.5	0.5	7.5	0.2	0.833	0.109	0.003	0.417	0.417	0.375	1.111	ACCEPT
W3-2I	12/28/2015	0.7	0.5	0.9	1.4	0.5	1.0	0.635	0.006	0.011	0.318	0.318	0.253	1.255	ACCEPT
T3-1	12/16/2015	0.6	0.5	1.1	0.7	2.9	0.6	0.946	0.048	0.010	0.473	0.473	0.373	1.268	ACCEPT
T3-2	12/16/2015	6.4	0.1	6.2	0.5	4.2	0.2	0.943	0.069	0.003	0.472	0.472	0.372	1.267	ACCEPT
T3-3P	12/16/2015	4.2	1.3	6.3	2.3	4.4	0.6	0.982	0.075	0.010	0.491	0.491	0.373	1.316	ACCEPT
T3-4P	12/16/2015	0.5	3.1	2.9	2.0	3.0	1.6	1.010	0.053	0.028	0.505	0.505	0.373	1.354	ACCEPT
T3-5	12/16/2015	0.4	0.1	1.8	0.6	2.5	1.3	0.964	0.063	0.022	0.482	0.482	0.372	1.296	ACCEPT
T3-6	12/16/2015	0.7	2.2	1.3	1.8	4.6	1.4	0.940	0.075	0.023	0.470	0.470	0.375	1.253	ACCEPT
T3-7	12/16/2015	3.9	1.0	4.2	1.0	4.0	0.5	0.940	0.041	0.008	0.470	0.470	0.375	1.253	ACCEPT
T3-8	12/16/2015	6.6	1.1	6.2	0.4	5.8	0.2	0.923	0.034	0.003	0.462	0.462	0.372	1.241	ACCEPT
T3-9I	12/16/2015	3.9	0.6	7.1	0.6	2.3	0.3	0.639	0.015	0.003	0.320	0.320	0.248	1.288	ACCEPT
T3-10I	12/16/2015	6.2	2.1	6.6	1.4	6.0	0.3	0.933	0.000	0.005	0.467	0.467	0.374	1.247	ACCEPT
T4-1	12/21/2015	3.6	4.4	3.9	3.7	5.1	0.7	0.943	0.084	0.012	0.472	0.472	0.373	1.264	ACCEPT
T4-2	12/21/2015	2.2	0.2	1.3	0.3	1.5	0.4	0.852	0.022	0.006	0.426	0.426	0.371	1.148	ACCEPT
T4-3	12/21/2015	1.3	0.8	0.4	0.1	1.0	1.7	0.939	0.020	0.028	0.470	0.470	0.370	1.269	ACCEPT
T4-4P	12/21/2015	2.7	4.4	1.5	4.5	3.4	1.6	0.942	0.082	0.026	0.471	0.471	0.373	1.263	ACCEPT
T4-5	12/21/2015	4.1	3.0	4.5	0.8	3.7	1.8	0.914	0.030	0.029	0.457	0.457	0.375	1.219	ACCEPT
T4-6P	12/21/2015	0.4	0.6	0.5	1.0	1.1	1.2	0.891	0.022	0.019	0.446	0.446	0.373	1.194	ACCEPT
T4-7	12/18/2015	8.0	1.8	7.9	1.9	6.8	1.9	0.937	0.111	0.031	0.469	0.469	0.370	1.266	ACCEPT
T4-8P	12/21/2015	2.4	0.1	1.5	0.3	0.8	1.8	0.948	0.021	0.030	0.474	0.474	0.372	1.274	ACCEPT
T4-10	12/29/2015	1.1	0.7	1.4	3.0	0.9	1.4	0.807	0.013	0.020	0.404	0.404	0.372	1.085	ACCEPT
T4-13	12/16/2015	0.0	0.2	0.4	1.5	0.9	0.7	0.928	0.030	0.011	0.464	0.464	0.375	1.237	ACCEPT
T4-14	12/16/2015	1.9	0.8	0.4	2.1	1.0	1.9	0.926	0.016	0.031	0.463	0.463	0.372	1.245	ACCEPT
T4-15	12/21/2015	0.8	0.4	1.5	1.1	1.9	0.8	0.934	0.031	0.013	0.467	0.467	0.372	1.255	ACCEPT
T4-16	12/16/2015	0.6	0.0	0.6	0.7	0.2	1.0	0.945	0.003	0.016	0.473	0.473	0.375	1.260	ACCEPT
T4-17	12/16/2015	3.7	0.3	3.0	0.8	3.4	1.3	0.936	0.035	0.021	0.468	0.468	0.370	1.265	ACCEPT
4-18	12/28/2015	1.8	1.2	1.2	0.4	2.1	0.1	0.937	0.034	0.002	0.469	0.469	0.372	1.259	ACCEPT
T5-1P	12/21/2015	6.2	4.8	5.7	4.6	6.3	1.5	0.935	0.103	0.024	0.468	0.468	0.372	1.257	ACCEPT
T5-2	12/22/2015	0.6	1.5	0.8	1.1	0.5	0.2	0.939	0.008	0.003	0.470	0.470	0.375	1.252	ACCEPT
T5-3P	12/21/2015	1.0	1.2	0.5	1.3	0.5	1.9	0.942	0.008	0.031	0.471	0.471	0.370	1.273	ACCEPT
T5-4	12/21/2015	1.0	0.3	0.0	0.2	0.4	0.2	0.924	0.006	0.003	0.462	0.462	0.375	1.232	ACCEPT
T5-7P	12/23/2015	1.4	0.4	2.1	1.1	1.2	1.2	0.841	0.018	0.018	0.421	0.421	0.359	1.171	ACCEPT
T5-8	12/21/2015	8.2	1.5	7.4	0.9	7.6	1.0	0.936	0.124	0.016	0.468	0.468	0.371	1.261	ACCEPT
T5-9	12/21/2015	4.1	0.7	3.6	0.3	5.1	1.2	0.948	0.084	0.020	0.474	0.474	0.375	1.264	ACCEPT
T6-1	12/21/2015	2.9	1.2	5.3	0.3	2.9	0.6	0.949	0.048	0.010	0.475	0.475	0.372	1.276	ACCEPT
T6-2	12/22/2015	5.8	1.5	6.0	0.8	4.5	1.5	0.949	0.074	0.025	0.475	0.475	0.370	1.282	ACCEPT
T6-3P	12/21/2015	2.6	0.5	6.6	1.0	3.1	1.7	0.947	0.051	0.028	0.474	0.474	0.374	1.266	ACCEPT
T6-5P	12/21/2015	1.7	1.4	1.1	2.3	1.6	0.8	0.922	0.026	0.013	0.461	0.461	0.375	1.229	ACCEPT
T6-6	12/21/2015	1.4	0.3	1.1	0.8	0.7	1.5	0.950	0.012	0.025	0.475	0.475	0.375	1.267	ACCEPT

ENVIRONMENTAL QUALITY MANAGEMENT
PITOT TUBE CALIBRATIONS

Pitot ID	Date Calibrated	α_1	β_1	α_2	β_2	Y	θ	A	z	w	P_α	P_β	D_t	A/2/D_t	Accept/Reject
T6-7	12/23/2015	2.2	1.8	1.0	1.1	0.3	0.9	0.940	0.005	0.015	0.470	0.470	0.375	1.253	ACCEPT
T6-9	12/21/2015	1.5	0.8	0.7	3.3	2.4	1.0	0.919	0.038	0.017	0.460	0.460	0.373	1.232	ACCEPT
T6-10	12/21/2015	0.8	1.0	0.5	2.7	0.4	1.6	0.947	0.007	0.026	0.474	0.474	0.370	1.280	ACCEPT
T6-12P	12/22/2015	0.6	1.6	1.4	2.0	4.9	0.1	0.939	0.080	0.002	0.470	0.470	0.374	1.255	ACCEPT
T6-13	12/22/2015	6.7	0.8	5.2	0.6	6.0	0.3	0.921	0.096	0.005	0.461	0.461	0.375	1.228	ACCEPT
T6-14P	12/21/2015	0.5	1.0	0.8	0.2	5.1	1.8	0.950	0.084	0.030	0.475	0.475	0.375	1.267	ACCEPT
T6-15P	12/21/2015	0.6	0.4	1.1	1.0	0.6	0.9	0.911	0.010	0.014	0.456	0.456	0.372	1.224	ACCEPT
T7-1	12/22/2015	2.3	0.2	2.5	0.7	3.5	0.9	0.863	0.053	0.014	0.432	0.432	0.374	1.154	ACCEPT
7-5I	12/22/2015	3.1	1.1	5.1	0.1	4.9	1.5	1.004	0.086	0.026	0.502	0.502	0.373	1.346	ACCEPT
T7-6I	12/31/2015	2.3	1.6	1.5	0.2	3.0	1.5	0.930	0.049	0.024	0.465	0.465	0.375	1.240	ACCEPT
7-10I	12/22/2015	1.2	4.8	1.7	1.2	1.5	0.5	1.005	0.026	0.009	0.503	0.503	0.375	1.340	ACCEPT
7-11	1/27/2016	3.0	0.2	3.0	0.6	4.8	0.0	0.890	0.074	0.000	0.445	0.445	0.375	1.187	ACCEPT
7-12I	1/27/2016	1.4	0.6	1.3	0.4	1.9	0.8	0.906	0.030	0.013	0.453	0.453	0.375	1.208	ACCEPT
7-13I	1/27/2016	3.2	0.2	2.0	0.9	4.0	1.5	0.916	0.063	0.013	0.458	0.458	0.375	1.221	ACCEPT
T8-1P	12/22/2015	1.1	0.5	1.3	0.5	1.5	1.2	0.905	0.024	0.019	0.453	0.453	0.374	1.210	ACCEPT
T8-3	12/22/2015	3.2	0.1	1.2	1.3	0.5	1.8	0.962	0.008	0.030	0.481	0.481	0.372	1.293	ACCEPT
T8-7	12/23/2015	8.0	1.0	7.2	0.9	3.2	0.3	0.952	0.053	0.005	0.476	0.476	0.374	1.273	ACCEPT
T8-8P	12/23/2015	3.7	1.0	4.1	0.9	1.0	1.3	0.940	0.016	0.021	0.470	0.470	0.372	1.263	ACCEPT
T8-9P	12/22/2015	2.2	2.1	2.3	1.8	3.9	0.3	0.943	0.064	0.005	0.472	0.472	0.373	1.264	ACCEPT
T8-19	12/22/2015	9.3	0.5	9.9	2.2	6.9	1.9	0.934	0.112	0.031	0.467	0.467	0.374	1.249	ACCEPT
T8-20	12/22/2015	4.1	0.1	3.4	0.7	5.0	1.8	0.938	0.082	0.029	0.469	0.469	0.371	1.264	ACCEPT
T8-21	12/22/2015	0.0	0.2	0.1	0.4	1.5	1.3	0.940	0.025	0.021	0.470	0.470	0.373	1.260	ACCEPT
8-24	12/31/2015	4.9	0.6	3.9	0.3	5.5	1.4	0.890	0.085	0.022	0.445	0.445	0.373	1.193	ACCEPT
T9-1	12/22/2015	0.5	1.0	0.4	0.6	1.8	1.8	0.943	0.030	0.030	0.472	0.472	0.375	1.257	ACCEPT
T9-2	12/22/2015	3.1	0.0	2.5	0.9	6.0	1.5	0.938	0.098	0.025	0.469	0.469	0.372	1.261	ACCEPT
T10-1	12/22/2015	6.7	0.5	7.4	1.0	4.9	1.8	0.944	0.081	0.030	0.472	0.472	0.371	1.272	ACCEPT
T10-2	12/22/2015	2.3	0.6	0.5	2.0	0.8	1.2	0.903	0.013	0.019	0.452	0.452	0.375	1.204	ACCEPT
T10-2P	12/22/2015	3.7	1.6	4.7	1.8	1.7	1.5	0.933	0.028	0.024	0.467	0.467	0.370	1.261	ACCEPT
T10-4	12/22/2015	1.2	4.5	1.0	1.5	1.7	1.6	0.877	0.026	0.024	0.439	0.439	0.368	1.192	ACCEPT
T12-1	12/22/2015	0.8	1.7	1.9	3.1	0.8	1.2	0.971	0.014	0.020	0.486	0.486	0.373	1.302	ACCEPT
T12-2	12/22/2015	4.8	2.7	3.5	1.5	7.5	1.4	0.916	0.120	0.022	0.458	0.458	0.370	1.238	ACCEPT
T12-3	12/22/2015	2.2	0.1	2.5	0.2	1.4	1.5	0.932	0.023	0.024	0.466	0.466	0.370	1.259	ACCEPT
T12-4	12/22/2015	1.5	0.5	1.6	0.0	2.0	1.7	1.008	0.035	0.030	0.504	0.504	0.372	1.355	ACCEPT
T14-1	12/22/2015	1.8	0.2	2.1	0.8	4.2	1.7	0.858	0.063	0.025	0.429	0.429	0.368	1.166	ACCEPT
Mp-1	12/16/2015	3.5	2.5	2.1	2.9	0.8	0.6	0.326	0.005	0.003	0.163	0.163	0.124	1.315	REJECT
Mp-2	12/16/2015	0.8	0.2	0.9	0.3	0.1	0.1	0.345	0.001	0.001	0.173	0.432	0.125	1.380	REJECT

TL-# = Thermocouple and Pitot
W#-I = Water Cooled Assembly

TL-#P = Thermocouple, Pitot, and Probe assembly

PL-# = Pitot alone

PL-#I = Inconell

TRIP BALANCE

The trip balance is calibrated by comparing it with Class-S standard weights, and it agreed within 0.5g. Calibration data are shown in the following Trip Balance Calibration Data Sheet(s).

ALPHA-LIBERTY COMPANY, INC.

BALANCES & SCALES
P.O. Box 276, West Chester, OH 45069
513-777-1525 FAX 513-777-0819

CERTIFICATE OF CALIBRATION

COMPANY: Environmental Quality Management, Inc. CERTIFICATE: D18139-001

LOCATION: 1800 Carillan Drive, Cincinnati, OH 45240 Attn: Ron Kolde

MANUFACTURER: Sartorius CAPACITY: 210g RESOLUTION: 0.1mg

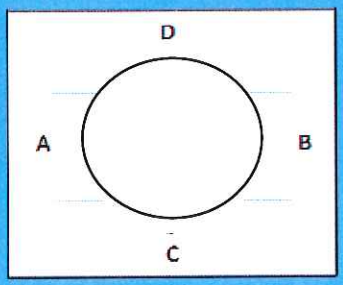
MODEL: BL210S SERIAL NO: 91001024 ID: SCHEDULE: yearly

This balance/scale performed to the following values on the calibration date:

WEIGHT	TOLERANCE	BEFORE	in	out	AFTER	in	out	
Zero	±0.3mg	0.0000g	√		0.0000g	√		
20g	±0.3mg	20.0003g	√		20.0000g	√		
50g	±0.3mg	50.0009g		√	50.0000g	√		
100g	±0.3mg	100.0015g		√	100.0001g	√		
200g	±0.3mg	200.0028g		√	200.0000g	√		

	CORNERLOAD WEIGHT: 100g						TOLERANCE: ±0.5mg					
	A	in	out	B	in	out	C	in	out	D	in	out
BEFORE READING	+0.0004g	√		0.0000g	√		0.0000g	√		+0.0005g	√	
AFTER READING	0.0000g	√		-0.0003g	√		-0.0004g	√		0.0000g	√	

WEIGHT SET NUMBER	A500028
NIST TRACEABILITY NUMBER	1973194
NEXT CALIBRATION DUE	December-16
CALIBRATION DATE	14-Dec-2015
TECHNICIAN SIGNATURE	Susan A. Lewis



CALIBRATION SITE: √ Customer Site ___ Laboratory ___ Other

CALIBRATION METHOD: √ Manufacturer's Procedure ___ Other

ISO/IEC 17025: ___ Compliant ___ Non-compliant √ Not Applicable

ENVIRONMENT: ___ Excellent √ Good ___ Fair ___ Poor

NOTES: 2 static masters

ALPHA-LIBERTY COMPANY, INC.

BALANCES & SCALES
P.O. Box 276, West Chester, OH 45069
513-777-1525 FAX 513-777-0819

CERTIFICATE OF CALIBRATION

COMPANY: Environmental Quality Management, Inc. CERTIFICATE: D18139-002

LOCATION: 1800 Carillan Drive, Cincinnati, OH 45240 Attn: Ron Kolde

MANUFACTURER: Ohaus CAPACITY: 2000g RESOLUTION: 0.1g

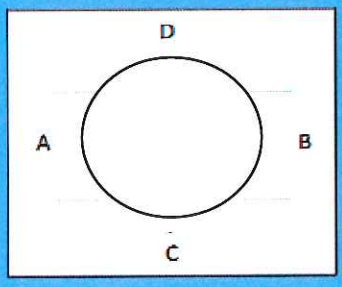
MODEL: SP2001 SERIAL NO: 7126521909 ID: FB3 SCHEDULE: yearly

This balance/scale performed to the following values on the calibration date:

WEIGHT	TOLERANCE	BEFORE	in	out	AFTER	in	out	
Zero	±0.3g	0.0g	√		0.0g	√		
200g	±0.3g	200.0g	√		200.0g	√		
500g	±0.3g	500.1g	√		500.0g	√		
1000g	±0.3g	1000.1g	√		1000.0g	√		
2000g	±0.3g	2000.2g	√		2000.0g	√		

	CORNERLOAD WEIGHT: 1000g						TOLERANCE: ±0.3g					
	A	in	out	B	in	out	C	in	out	D	in	out
BEFORE READING	0.0g	√		0.0g	√		0.0g	√		0.0g	√	
AFTER READING	0.0g	√		0.0g	√		0.0g	√		0.0g	√	

WEIGHT SET NUMBER	A500120
NIST TRACEABILITY NUMBER	1973194
NEXT CALIBRATION DUE	December-16
CALIBRATION DATE	14-Dec-2015
TECHNICIAN SIGNATURE	Susan A. Lewis



CALIBRATION SITE: √ Customer Site ___ Laboratory ___ Other

CALIBRATION METHOD: √ Manufacturer's Procedure ___ Other

ISO/IEC 17025: ___ Compliant ___ Non-compliant √ Not Applicable

ENVIRONMENT: ___ Excellent √ Good ___ Fair ___ Poor

NOTES: _____

ALPHA-LIBERTY COMPANY, INC.

BALANCES & SCALES
P.O. Box 276, West Chester, OH 45069
513-777-1525 FAX 513-777-0819

CERTIFICATE OF CALIBRATION

COMPANY: Environmental Quality Management, Inc. CERTIFICATE: D18139-003

LOCATION: 1800 Carillan Drive, Cincinnati, OH 45240 Attn: Ron Kolde

MANUFACTURER: Ohaus CAPACITY: 2000g RESOLUTION: 0.1g

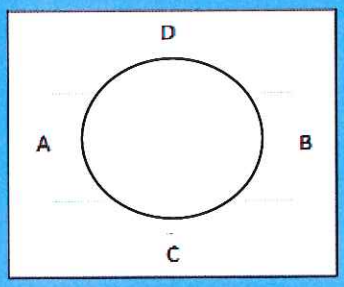
MODEL: SP2001 SERIAL NO: 7129330051 ID: FB4 SCHEDULE: yearly

This balance/scale performed to the following values on the calibration date:

WEIGHT	TOLERANCE	BEFORE	in	out	AFTER	in	out	
Zero	±0.3g	0.0g	√		0.0g	√		
200g	±0.3g	200.0g	√		200.0g	√		
500g	±0.3g	500.0g	√		500.0g	√		
1000g	±0.3g	1000.0g	√		1000.0g	√		
2000g	±0.3g	2000.0g	√		2000.0g	√		

	CORNERLOAD WEIGHT: 1000g						TOLERANCE: ±0.3g					
	A	in	out	B	in	out	C	in	out	D	in	out
BEFORE READING	0.0g	√		0.0g	√		+0.1g	√		-0.1g	√	
AFTER READING	0.0g	√		0.0g	√		+0.1g	√		-0.1g	√	

WEIGHT SET NUMBER	A500120
NIST TRACEABILITY NUMBER	1973194
NEXT CALIBRATION DUE	December-16
CALIBRATION DATE	14-Dec-2015
TECHNICIAN SIGNATURE	Laura A. Lewis



CALIBRATION SITE: √ Customer Site ___ Laboratory ___ Other

CALIBRATION METHOD: √ Manufacturer's Procedure ___ Other

ISO/IEC 17025: ___ Compliant ___ Non-compliant √ Not Applicable

ENVIRONMENT: ___ Excellent √ Good ___ Fair ___ Poor

NOTES: _____

ALPHA-LIBERTY COMPANY, INC.

BALANCES & SCALES
P.O. Box 276, West Chester, OH 45069
513-777-1525 FAX 513-777-0819

CERTIFICATE OF CALIBRATION

COMPANY: Environmental Quality Management, Inc. CERTIFICATE: D18139-004

LOCATION: 1800 Carillan Drive, Cincinnati, OH 45240 Attn: Ron Kolde

MANUFACTURER: Acculab CAPACITY: RESOLUTION: 0.1g

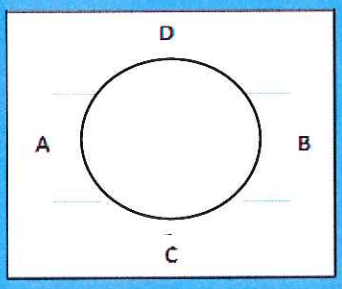
MODEL: VIC - 3101.1 SERIAL NO: 23654832 ID: FB2 SCHEDULE: yearly

This balance/scale performed to the following values on the calibration date:

WEIGHT	TOLERANCE	BEFORE	in	out	AFTER	in	out	
Zero	±0.3g	0.0g	√		0.0g	√		
500g	±0.3g	500.0g	√		200.0g	√		
1000g	±0.3g	1000.0g	√		500.0g	√		
2000g	±0.3g	2000.2g	√		1000.0g	√		
3000g	±0.3g	3000.4g		√	3000.1g	√		

	CORNERLOAD WEIGHT: 500g						TOLERANCE: ±0.3g					
	A	in	out	B	in	out	C	in	out	D	in	out
BEFORE READING	+0.1g	√		-0.1g	√		-0.1g	√		0.0g	√	
AFTER READING	+0.1g	√		-0.1g	√		-0.1g	√		0.0g	√	

WEIGHT SET NUMBER	A500120
NIST TRACEABILITY NUMBER	1973194
NEXT CALIBRATION DUE	December-16
CALIBRATION DATE	14-Dec-2015
TECHNICIAN SIGNATURE	Susan A. Lewis



CALIBRATION SITE: √ Customer Site ___ Laboratory ___ Other

CALIBRATION METHOD: √ Manufacturer's Procedure ___ Other

ISO/IEC 17025: ___ Compliant ___ Non-compliant √ Not Applicable

ENVIRONMENT: ___ Excellent √ Good ___ Fair ___ Poor

NOTES: _____

ALPHA-LIBERTY COMPANY, INC.

BALANCES & SCALES
P.O. Box 276, West Chester, OH 45069
513-777-1525 FAX 513-777-0819

CERTIFICATE OF CALIBRATION

COMPANY: Environmental Quality Management, Inc. CERTIFICATE: D18139-005

LOCATION: 1800 Carillan Drive, Cincinnati, OH 45240 Attn: Ron Kolde

MANUFACTURER: Ohaus CAPACITY: 2000g RESOLUTION: 0g

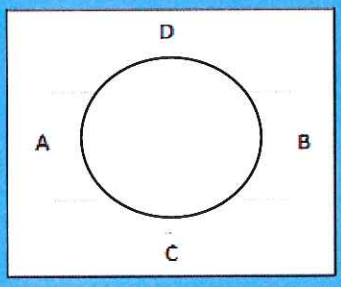
MODEL: CS2000 SERIAL NO: 121508 ID: FB1 SCHEDULE: yearly

This balance/scale performed to the following values on the calibration date:

WEIGHT	TOLERANCE	BEFORE	in	out	AFTER	in	out	
Zero	±3g	0g	√		0g	√		
200g	±3g	200g	√		200g	√		
500g	±3g	500g	√		500g	√		
1000g	±3g	1000g	√		1000g	√		
2000g	±3g	2000g	√		2000g	√		

	CORNERLOAD WEIGHT: 1000g						TOLERANCE: ±3g					
	A	in	out	B	in	out	C	in	out	D	in	out
BEFORE READING	0g	√		0g	√		0g	√		0g	√	
AFTER READING	0g	√		0g	√		0g	√		0g	√	

WEIGHT SET NUMBER	A500120
NIST TRACEABILITY NUMBER	1973194
NEXT CALIBRATION DUE	December-16
CALIBRATION DATE	14-Dec-2015
TECHNICIAN SIGNATURE	Steven A. Lewis



CALIBRATION SITE: √ Customer Site ___ Laboratory ___ Other

CALIBRATION METHOD: √ Manufacturer's Procedure ___ Other

ISO/IEC 17025: ___ Compliant ___ Non-compliant √ Not Applicable

ENVIRONMENT: ___ Excellent √ Good ___ Fair ___ Poor

NOTES: _____

CONTINUOUS EMISSION MONITORS CALIBRATION STANDARDS

The calibration gases used for the calibration of the continuous gas analyzers must be within +/- 1 percent of the certified gas value. EQ calibration standards follow the Environmental Protection Agency Traceability Protocol Number 1. The calibration gas certifications used for this study are attached.

Airgas

Airgas USA, LLC
2009 BELLAIRE AVE
ROYAL OAK, MI 48067
248-399-8020
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Customer:	ENVIRONMENTAL QUALITY MANAGEMENT		
Part Number:	E03NI67E15A00A2	Reference Number:	32-400628908-1
Cylinder Number:	CC443447	Cylinder Volume:	160.0 CF
Laboratory:	MIC - Royal Oak-32 (SAP) - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B62015	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Nov 19, 2015

Expiration Date: Nov 19, 2023

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
OXYGEN	11.00 %	11.02 %	G1	+/- 1% NIST Traceable	11/19/2015
CARBON DIOXIDE	22.00 %	21.94 %	G1	+/- 0.6% NIST Traceable	11/19/2015
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	98050917	SG9168288BAL	16.04 % OXYGEN/NITROGEN	+/- 0.6%	Dec 01, 2015
NTRM	13060812	CC416634	24.04 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 16, 2019

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
E/N 54 Nicolet 6700 CO2	FTIR	Nov 18, 2015
O2 FS, SIEMENS OXYMAT 6 E/N 182	Paramagnetic	Oct 23, 2015

Triad Data Available Upon Request

Signature on file

Approved for Release

Airgas

Airgas USA, LLC
2009 BELLAIRE AVE
ROYAL OAK, MI 48067
248-399-8020
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Customer:	ENVIRONMENTAL QUALITY MANAGEMENT		
Part Number:	E03NI67E15A52R2	Reference Number:	32-400628907-1
Cylinder Number:	CC443456	Cylinder Volume:	152.9 CF
Laboratory:	MIC - Royal Oak-32 (SAP) - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B62015	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Nov 18, 2015

Expiration Date: Nov 18, 2023

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	11.00 %	11.23 %	G1	+/- 0.7% NIST Traceable	11/18/2015
OXYGEN	22.00 %	21.89 %	G1	+/- 1.0% NIST Traceable	11/18/2015
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12061344	CC360802	11.002 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	Jan 11, 2018
NTRM	12062011	CC367544	22.883 % OXYGEN/NITROGEN	+/-0.2%	Apr 24, 2018

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
E/N 54 Nicolet 6700 CO2	FTIR	Oct 19, 2015
O2 FS, SIEMENS OXYMAT 6 E/N 182	Paramagnetic	Oct 23, 2015

Triad Data Available Upon Request

Approved for Release

Airgas

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Airgas USA, LLC
2009 BELLAIRE AVENUE
ROYAL OAK, MI 48067
248-399-8020
Airgas.com

Customer:	ENVIRONMENTAL QUALITY MANAGEMENT		
Part Number:	E02NI99E15A0499	Reference Number:	32-400493989-1
Cylinder Number:	CC73679	Cylinder Volume:	144.3 CF
Laboratory:	MIC - Royal Oak-32 (SAP) - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B62015	Valve Outlet:	350
Gas Code:	CO,BALN	Certification Date:	Feb 12, 2015

Expiration Date: Feb 12, 2023

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON MONOXIDE	450.0 PPM	454.8 PPM	G1	+/- 1.0% NIST Traceable	02/12/2015
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12062408	CC199564	487.1 PPM CARBON MONOXIDE/NITROGEN	+/-0.6%	Jun 22, 2018

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
CO SIEMENS ULTRAMAT 6 E/N 173	Nondispersive Infrared(NDIR)	Feb 07, 2015

Triad Data Available Upon Request

Approved for Release

Airgas

Airgas USA, LLC
2009 BELLAIRE AVE
ROYAL OAK, MI 48067
248-399-8020
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Customer:	ENVIRONMENTAL QUALITY MANAGEMENT		
Part Number:	E02NI99E15A0154	Reference Number:	32-400586127-1
Cylinder Number:	CC66198	Cylinder Volume:	144.4 CF
Laboratory:	MIC - Royal Oak-32 (SAP) - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B62015	Valve Outlet:	660
Gas Code:	SO2,BALN	Certification Date:	Aug 27, 2015

Expiration Date: Aug 27, 2019

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
SULFUR DIOXIDE	45.00 PPM	44.88 PPM	G1	+/- 1.0% NIST Traceable	08/20/2015, 08/27/2015
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12061827	CC352163	50.10 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%	Apr 24, 2018

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
E/N 54 Nicolet 6700 SO2	FTIR	Aug 11, 2015

Triad Data Available Upon Request

Approved for Release

Airgas

Airgas USA, LLC
2009 BELLAIRE AVE
ROYAL OAK, MI 48067
248-399-8020
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Customer:	ENVIRONMENTAL QUALITY MANAGEMENT		
Part Number:	E02NI99E15A0239	Reference Number:	32-400693191-1
Cylinder Number:	SG9134953BAL	Cylinder Volume:	144.4 CF
Laboratory:	MIC - Royal Oak-32 (SAP) - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B62016	Valve Outlet:	660
Gas Code:	SO2,BALN	Certification Date:	Apr 08, 2016

Expiration Date: Apr 08, 2024

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
SULFUR DIOXIDE	90.00 PPM	89.09 PPM	G1	+/- 0.9% NIST Traceable	04/01/2016, 04/08/2016
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12060238	CC351199	95.39 PPM SULFUR DIOXIDE/NITROGEN	+/-0.8%	Jan 10, 2018

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
E/N 54 Nicolet 6700 SO2	FTIR	Mar 08, 2016

Triad Data Available Upon Request

Approved for Release

Airgas

Airgas USA, LLC
2009 BELLAIRE AVE
ROYAL OAK, MI 48067
248-399-8020
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Customer:	ENVIRONMENTAL QUALITY MANAGEMENT		
Part Number:	E02NI99E15A1004	Reference Number:	32-400693196-1
Cylinder Number:	CC21157	Cylinder Volume:	144.4 CF
Laboratory:	MIC - Royal Oak-32 (SAP) - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B62016	Valve Outlet:	660
Gas Code:	SO2,BALN	Certification Date:	Apr 08, 2016

Expiration Date: Apr 08, 2024

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
SULFUR DIOXIDE	190.0 PPM	189.4 PPM	G1	+/- 1.0% NIST Traceable	04/01/2016, 04/08/2016
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	15060637	CC450476	248.1 PPM SULFUR DIOXIDE/NITROGEN	+/-0.6%	Dec 17, 2020

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
E/N 54 Nicolet 6700 SO2	FTIR	Mar 08, 2016

Triad Data Available Upon Request

Approved for Release

Airgas

Airgas USA, LLC
2009 BELLAIRE AVE
ROYAL OAK, MI 48067
248-399-8020
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Customer:	ENVIRONMENTAL QUALITY MANAGEMENT		
Part Number:	E02NI99E15A0259	Reference Number:	32-400693192-1
Cylinder Number:	CC208805.	Cylinder Volume:	144.4 CF
Laboratory:	MIC - Royal Oak-32 (SAP) - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B62016	Valve Outlet:	660
Gas Code:	SO2,BALN	Certification Date:	Apr 11, 2016

Expiration Date: Apr 11, 2024

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
SULFUR DIOXIDE	450.0 PPM	453.7 PPM	G1	+/- 1.1% NIST Traceable	04/04/2016, 04/11/2016
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	16060117	CC437401	515.2 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 16, 2021

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
E/N 54 Nicolet 6700 SO2	FTIR	Apr 11, 2016

Triad Data Available Upon Request

Approved for Release